

S/021/60/000/008/003/011  
D210/D305

On the approximation of ...

takes place and some absolute constant  $C$  exists for which

$$|\rho_{mn}| < C \left[ \frac{\ln n + \ln m}{m^l} \left( \frac{1}{n^a} + \frac{1}{m^b} \right) \right] + C \left( \frac{1}{n^{l+a}} + \frac{1}{m^{l+b}} \right).$$

Similar results for the functions of one variable were obtained by A. Kolmogorott (Ref. 1: Annals of Math., 36, 521, 1936); for  $r = l = 0$  this theorem was proved by F.T. Buhayetz (Ref. 5: AN DAN SSSR, 29, 557, 1951). The theorem follows from the results of I.G. Sokolov (Ref. 3: DAN SSSR, 103, 23, 1955) and V.Y. Hukevych (Ref. 4: Teor. i prikl. matem. 1. 3, 1959) and from two lemmas mentioned in the paper. For the functions belonging to the class  $K_1 K_2 W(r)$

$H(\alpha, \beta)$  the similar asymptotic equality for  $E_{mn}$  is true.

$$E_{mn} = \frac{8 \ln n \ln m}{\pi^2 (m^2 + n^2)^2} \int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} \min \left[ K_1 \left( \frac{2u}{n} \right)^a, K_2 \left( \frac{2v}{m} \right)^b \right] \sin u \sin v du dv + \rho_{mn}, \quad (2)$$

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where

$$\rho_{mn} = O \left[ \frac{\ln n + \ln m}{(m^2 + n^2)^r} \left( \frac{1}{n^\alpha} + \frac{1}{m^\beta} \right) \right]$$

and  $K_1 K_2 W^{(r)}_H(\alpha, \beta)$  means a class of function periodical with respect to  $x$  and  $y$  (period -  $2\pi$ ) which have the generalized derivatives according to Sobolyev of the  $2r$  order with the property that for the functions  $\varphi(x, y) = \Delta(\Delta^{r-1} f) = \Delta^r f$  where

$$\Delta = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \quad (r = 1, 2, \dots) \text{ the following condition is true}$$

$$|\varphi(x_2, y_2) - \varphi(x_1, y_1)| \leq K_1/x_2 - x_2^\alpha + K_2/y_2 - y_1^\beta \quad (0 < \alpha, \beta < 1).$$

The proof follows from the work of Ya.S. Buhrov (Ref. 6: UMN 13, 2 (80), 149, 1958) and from Lemma 2. There are 6 references: 5 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-lan-

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guage publication reads as follows: A. Kolmogoroff, Annals of  
Math. 36, 521, 1936.

ASSOCIATION: Lvivs'kyi derzhavnyi universytet (State University of  
L'vov)

PRESENTED: by V. V. Gnydenko, Academician AS UkrSSR

SUBMITTED: September 23, 1959

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S/044/63/000/002/007/050  
A060/A126

AUTHOR: Gorbach, M.M.

TITLE: On approximating functions with the aid of the Riess-Bochner operator.

PERIODICAL: Referativnyi zhurnal, Matematika, no. 2, 1963, 20, abstract 2B91  
(Zb. rob. aspirantiv Mekhan.-matem. ta fiz. fak. L'vivs'k. un-t, 1961, no. 1, 19 - 33; Ukrainian)

TEXT: The author considers the approximation of functions of the classes  $KB_r^{(\alpha)}$  and  $I_p V$  by the Riess-Bochner operator

$$S_R^{(\delta)}(f; x, y) = 2^\delta \Gamma(1 + \delta) \int_0^\infty f_{x,y}(t) \frac{t^{1+\delta} (Rt)^\delta}{(Rt)^\delta} d(R \cdot t)$$

and the operators

$$S_R^{(\delta)}(f) = 2^\delta \Gamma(1 + \delta) \int_0^\infty f(t+x) \frac{t^{1+\delta} (Rt)^\delta}{(Rt)^\delta} d(R \cdot t).$$

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On approximating functions with the aid of ....

respectively, where  $KB_r^{(\alpha)}$  is the class of functions  $f(x, y)$  for which

$$\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} |f(x, y)| dx dy < \infty \quad \text{and} \quad f_{x,y}^{(r)}(t) \in K Lip \alpha \quad \text{in } t$$

$$f_{x,y}(t) = \frac{1}{2\pi} \int_0^{2\pi} f(x + t \cos \theta, y + t \sin \theta) d\theta,$$

$$r = 0, 1, \quad 0 < \alpha \leq 1,$$

$K$  is an absolute constant;  $L_p V$  is a class of functions  $f(x)$  of bounded variation on the entire real axis and summable upon it in the  $p$ -th power ( $1 \leq p \leq 2$ ). The paper consists of two parts. In the first part the quantity

$$E_n^{(q)}(KB_r^{(\alpha)}) = \sup_{f \in KB_r^{(\alpha)}} |f(x, y) - S_n^{(q)}(f; x, y)|$$

is investigated, in the second an asymptotic estimate is given for

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On approximation functions with the aid of ....

$$\|f(x) - \sigma_R(f)\|_{L_p} \quad (1 < p < 2), \quad f(x) \in L_p V,$$

where

$$\sigma_R(f) = S_R^{(\frac{1}{2})}(f).$$

The following theorems are demonstrated: 1) If  $\delta > \frac{1}{2}$  and  $0 < \alpha < 1$ , then

$$E_R^{(\delta)}(KB_r^{(\alpha)}) = O\left(\frac{1}{R^{\delta+\alpha}}\right),$$

and the right-hand member of that equality is independent of  $x$  and  $y$ . 2) If  $\delta = \frac{1}{2}$ ,  $0 < \alpha < 1$ , then

$$E_R^{(\frac{1}{2})}(KB_r^{(\alpha)}) = \frac{K \cdot 2^{1+\alpha}}{\pi} \frac{\ln R}{R^{2+\alpha}} \int_0^{\frac{\pi}{2}} u^{\alpha} \sin u du + O\left(\frac{1}{R^{2+\alpha}}\right).$$

3) (Without proof.) If  $f(x) \in L_p V$  ( $1 < p < 2$ ), then

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$$\|f(x) - \sigma_R(f)\|_{L_p} < C \frac{V^{\frac{1}{p}} \omega\left(\frac{1}{R}, f\right)}{R^{\frac{1}{p}}} \left(\frac{1}{p} + \frac{1}{q} - 1\right),$$

where  $C$  is a constant independent of  $f$  and  $R$ ,  $V$  is the total variation of  $f(x)$  over the entire axis,

$$\omega\left(\frac{1}{R}, f\right) = \sup_x \sup_{|h| < \frac{1}{R}} |f(x+h) - f(x)|.$$

4) If  $f(x) \in V$  (of bounded variation), then

$$|f(x) - \sigma_R(f)| < C \operatorname{var} f(x),$$

where  $C$  is a constant independent of  $R$  and  $f(x)$ . 5) If  $f(x) \in L_p$  ( $1 < p \leq 2$ ) and  $x_1, x_2, x_3, \dots$  are the points where  $f(x)$  has jumps  $\sigma_k = f(x_k + 0) - f(x_k - 0)$ , then

$$\|f(x) - \sigma_R(f)\|_{L_p} \approx \frac{C(p)}{R^{\frac{1}{p}}} \left( \sum_{k=1}^{\infty} |\sigma_k|^p \right)^{\frac{1}{p}} (R \rightarrow \infty),$$

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where

$$C(p) = \left( \int_0^{\infty} \left| \frac{\sin x}{x} \right|^p dx \right)^{1/p}$$

It is noted (without proof) that results analogous to Theorem 2 hold also for functions of  $n$  variables if one considers  $\delta > \frac{n-1}{2}$ . The author notes that these investigations of his extend to the case of many variables the known results for one variable (see S.M. Nikol'skiy, Dokl. AN SSSR, 1941, v. 32, 386 - 389; Tr. Matem. in-ta AN SSSR, 1945, 1 - 76; Izv. AN SSSR, 1949, v. 13, 513 - 532).

G.K. Lebed'

[Abstracter's note: Complete translation]

Card 5/5



GOREACH, M.S. [Horbach, M.S.]

Development and changes in the individual characteristics of  
attention in elementary school pupils. Nauk. zap. ChDPI 8:113-129  
'56. (MIRA 11:2)

(Attention) (Child study)

1. GORBACH, N.
2. USSR (600)
4. Wheat
7. Siberian wheat. Nauka i zhizn' 20, No. 3, 1953.

9. Monthly List of Russian Accessions, Library of Congress, April 1953. Unclassified.

GORBUACH, N. [Horbach, N.]

Mikhail Petrovich Tomin. Vestsi AN BSSR. Ser. biial. nav.  
no. 3:98-101 '58. (MIRA 11:11)  
(Tomin, Mikhail Petrovich, 1883)

MAN'KOVSKIY, N.B., kand.med.nauk; GORBACH, N.D., kand.med.nauk

Electroencephalogram changes in rheumatic inflammations of the  
brain. Vop. klin. nevr. i psikh. no.2:118-137 '58. (MIRA 14:10)  
(ELECTROENCEPHALOGRAPHY) (RHEUMATIC FEVER)  
(BRAIN--INFLAMMATION)

MAKARCHENKO, A.F.; GORBACH, N.I.

Bioelectrical activity of the cerebral cortex in infectious diseases of the nervous system. Fiziol.shmr. [Ukr.] 2 no.5:26-34 S-O '56.  
(MIRA 10:1)

1. Institut fiziologii imeni O.O.Bogomol'tsya Akademii nauk USSR.  
(ELECTROPHYSIOLOGY) (CEREBRAL CORTEX)  
(NERVOUS SYSTEM--DISEASES)

GORBACH, N.L.

Bioclectrical activity of the cerebral cotax in tumors of the fovea  
anterior. Fisiol.shur. [Ukr.] 2 no.6:3-11 M-D '56. (MLRA 10:2)

1. Ukrainskiy naukovo-doslidniy institut neyrokhirugii, Kiy.  
(SKULL-TUMORS) (CEREBRAL CORTEX) (ELECTROPHYSIOLOGY)

X  
GORBACH, N. L. Cand Med Sci -- (diss) "Bioelectric activity of the cerebral  
cortex in ~~anterior~~ tumors of the <sup>posterior</sup> occipital cranial fossa." Kiev, 1957. 19 pp  
(Dept of Biol Sci, Acad Sci USSR), 100 copies (KL, 45-57, 99)

MINTS, A.Ya.; GORBACH, N.L.

Some characteristics of the cerebral electrical activity in the process of ageing in atherosclerosis. Zhur. nevr. i psikh. 64 no.2:219-224 '64. (MIRA 17:5)

1.

1. Otsleneniye vrazhastnykh izmeneniy nervnoy sistemy (zaveduyushchiy - prof. B.N. Man'kovskiy) Instituta gerontologii AMN SSSR i otdel nevrologii i neyrofiziologii (rukovoditel' - prof. A.F. Makarchenko) Instituta fiziologii im. A.A. Bogomol'tsa AN UkrSSR, Kiyev.



GORBACH, N.L. [Horbach, M.L.]

Basic philosophical problems in biological cybernetics.  
Fiziol. zhur. [Ukr.] 9 no.2:151-157 Mr-Apr '63.

(MIRA 18:3)

1. Otdel nevrologii i neyrofiziologii Instituta fiziologii im.  
Bogomol'tsa AN UkrSSR, Kiyev.

ZIL'BERSHMID, V.G.; GORBACH, N.L.

Drilling structural-prospecting wells in salt sediments.  
Burenie no.4:12-13 '65.

(MIRA 18:5)

1. Permskiy politekhnicheskiy institut.

MAKARCHENKO, A.F. [Makarchenko, O.F.]; DINABURG, A.D. [Dynaburg, H.D.];  
~~GORBACH, M.L.~~ [Horbach, M.L.]; SAYENKO-LYUBARSKAYA, V.F. [Saenko-  
Liubars'ka, V.F.]; LAUTA, A.D.; YERYSH, A.I. [Ierysh, A.I.]; KLEBANOVA,  
L.B.

Clinicophysiological characteristics of diencephalic pathology.  
Fiziol. zhur. [Ukr.] 10 no.3:371-378 My-Je '64. (MIRA 18:9)

1. Otdel nevrologii i neyrofiziologii Institut fiziologii im. A.A.  
Bogomol'tsa AN UkrSSR, Kiyev.

GORBACH, N. N.

Our experience in the development of virgin soils and in raising high crop yields  
Moskva, Znanie 1954.

N.N.  
GORBACH, M.M. [Horbach, N.N.]

Approximation of periodic functions of two variables by Fourier sums.  
Dop.AN URSR no.8:1016-1018 '60. (MIRA 13:9)

1. L'vovskiy gosudarstvennyy universitet. Predstavleno akademikom  
AN USSR B.V. Gnedenko.  
(Functions, Periodic)

16.2600

S/020/60/135/004/002/037

16.4200

C111/C222

AUTHOR: Gorbach, N.N.

TITLE: Summation of Fourier Integrals of Functions of Many Variables by the Method of Riesz-Bochner

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol.135, No.4, pp.771-774

TEXT: Let  $KG^{(\alpha)}$  be the class of functions of two variables summable in the whole plane

$$(1) \quad \iint_{-\infty}^{\infty} |f(x,y)| dx dy < \infty$$

and having the property that the means

$$\bar{f}(t) = \frac{1}{2\pi} \int_0^{2\pi} f(x+t \cos \theta, y+t \sin \theta) d\theta$$

satisfy the condition

$$\bar{f}(t) \in K \text{ lip } \alpha, \quad 0 \leq \alpha \leq 1.$$

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S/020/60/135/004/002/037  
C111/G222

Summation of Fourier Integrals of Functions of Many Variables by the Method of Riesz-Bochner

Let

$$S_R^{(\delta)}(f; x, y) = \frac{1}{2\pi} \int \int_{\mathbb{R}} K_\delta\left(\frac{v}{R}\right) a(\alpha, \beta) e^{i(\alpha x + \beta y)} d\alpha d\beta,$$

$v^2 = \alpha^2 + \beta^2$ , where  $a(\alpha, \beta)$  is the Fourier transform of  $f(x, y)$  and

$$K_\delta(t) = \begin{cases} (1-t^2)^\delta & \text{if } 0 \leq t \leq 1 \\ 0 & \text{if } t > 1 \end{cases} \quad \left(\delta \geq \frac{1}{2}\right).$$

Let

$$\mathcal{E}_R^{(\delta)}(KG^{(\alpha)}) = \sup_{f \in KG^{(\alpha)}} \max_{(x, y)} |f(x, y) - S_R^{(\delta)}(f; x, y)|$$

Theorem 1: For the functions of the class  $KG^{(\alpha)}$  ( $\delta > \frac{1}{2}$ ) it holds the asymptotic equation

$$\mathcal{E}_R^{(\delta)}(KG^{(\alpha)}) = O\left(\frac{1}{R^\alpha}\right).$$

Theorem 2: For the functions of the class  $KG^{(\alpha)}$  ( $\delta = \frac{1}{2}$ ) it asymptotically

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Summation of Fourier Integrals of Functions of Many Variables by the Method of Riesz-Bochner

holds

$$\mathcal{E}_R^{(1/2)}(KG^{(\alpha)}) = \frac{K2^{\alpha+1}}{\pi} \cdot \frac{\ln R}{R^\alpha} \int_0^{\pi/2} u^\alpha \sin u \, du + O\left(\frac{1}{R^\alpha}\right).$$

Let  $KG_r^{(\alpha)}$  be the class of functions satisfying (1) and for which  $\tilde{f}(t)$  has an  $r$ -th ( $r=0,1$ ) derivative  $\tilde{f}^{(r)}(t) \in K \text{ Lip } \alpha$ ,  $0 \leq \alpha \leq 1$ .

Theorem 2': For the functions of the class  $KG_r^{(\alpha)}$  ( $\delta = \frac{1}{2}$ ) it asymptotically holds:

$$\mathcal{E}_R^{(1/2)}(KG_r^{(\alpha)}) = \frac{K2^{\alpha+1}}{\pi} \cdot \frac{\ln R}{R^{r+\alpha}} \int_0^{\pi/2} u^\alpha \sin u \, du + O\left(\frac{1}{R^{r+\alpha}}\right).$$

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C111/C222

Summation of Fourier Integrals of Functions of Many Variables by the Method of Riesz-Bochner

Analogous results hold for the functions of  $n$  variables if  $\delta \geq \frac{n-1}{2}$  is considered.

There are 3 references: 2 Soviet and 1 American.

ASSOCIATION: L'vovskiy gosudarstvennyy universitet (L'vov State University)

PRESENTED: June 28, 1960, by I.M. Vinogradov, Academician

SUBMITTED: June 20, 1960

Card 4/4

GORBACH, N.V.

Lichen epiphytes and their share in forest biocoenoses. Izv. AN  
BSSR no.3:119-125 My-Je '55. (MIRA 8:12)  
(Lichens) (Forest ecology)

GORBACH, N.Y.

New genus of lichens in the U.S.S.R., Vestsi AN BSSR, Ser. biol. nat.  
no. 3:119-120 '56. (MIRA 10:1)

(Lichens)

GORBACH, N.V.

Materials on the lichens of White Russia; lichens of the Byalovezhska Pushcha. Biol. Inst. biol. AN BSSR no. 2:43-46 '57.  
(Byalovezhska Pushcha--Lichens) (MIRA 11:2)

KRUGANOVA, Ye.A. [Kruhanava, Ye.A.], kand.biolog. nauk; GORBACH, N.V.  
[Horbach, N.V.], kand.biolog. nauk

In the White Russian Section of the All-Union Botanical Society.  
Vestsi AN BSSR.Ser.biol.nauk. no.2:138-140 '59. (MIRA 12:9)  
(WHITE RUSSIA--BOTANICAL RESEARCH)

KRUGANOVA, Ye.; GORRACH, N.V.

Some results of work of the White Russian Section of the All-  
Union Botanical Society. Bot.zhur. 45 no.3:466-469 Nr '60.  
(MIRA 13:6)

1. Institut biologii Akademii nauk BSSR, Minsk.  
(White Russia--Botanical research)

GORBACH, N.V. [Horbach, N.V.]

*Pertusaria muscicola* Gorbatsch, a new species hitherto unknown to  
scientists. Vestsi AN BSSR. Ser. biial. nav. no.3:115-116 '61.  
(MIRA 14:10)

(KEDROVAYA PAD' PRESERVE LICHENS)

GORBACH, N.V.

Materials on the lichen flora of White Russia. Sbor. nauch.  
rab. Bel. otd. VBO no.3:174-177 '61. (MIRA 14:12)  
(Nesvizh region--Lichens)



GORBACH, N.V. [Horbach, N.V.]

Studying lichen formations on the trunks and branches of basic  
forest trees. Vestsi AN BSSR Ser. bial. nav. no.1:100-106 '62.  
(MIRA 17:9)

GORBACH, N.V. [Horbach, N.V.]

Lichens of the genus Ramalina Ach. in White Russia. Vestsi  
AN BSSR, Ser. bial. nav. no.3:102-104 '63 (MIRA 17:7)

GORBACH, N.V. [Horbach, N.V.]

Lichens of the genus *Alectoria* Ach. in White Russia. Vestsi  
AN BSSR. Ser. biol. nav. no.1:55-58 '65. (MIRA 18:5)

GORBACH, N.V.; OSMOLOVSKAYA, A.I.

New and rare lichens of White Russia. Bot.; issl. Bel. otd. VB0  
no. 7: 178-180 '65. (MIRA 18:12)

SAPEL'NIKOV, Ya.; GOLOVATYY, I.; GLAZUNOVA, V. aspirant, (Moskva); USTINOV, I.; KOLENKO, A.; KONDRATSKIY, A.; YEFREMOVA, L.; CORBACH, P., konstruktor (Moskva); BERGER, I., kand. ekon. nauk; KLEPIKOV, N.; SINYUTIN, V., kand. ekon. nauk; KORZHENEVSKIY, I., kand. ekon. nauk; PEREPLETCHIK, I.

Fiftieth anniversary of "Pravda." Sov. torg. 35 no.5:38-42  
My '62. (MIRA 15:5)

1. Nachal'nik Planovo-ekonomicheskogo upravleniya Ministerstva torgovli RSFSR (for Sapel'nikov). 2. Nachal'nik planovogo otdela kurorttorga, g. Berdyansk (for Golovaty). 3. Moskovskiy ordena Trudovogo Krasnogo znameni institut narodnogo khozyaystva im. G.V. Plekhanova (for Glazunova). 4. Nachal'nik Otdela tovarooborota Gosplana USSR, g. Kiyev (for Kolenko). 5. Glavnyy bukhgalter Zhitomirskogo gorodskogo torga po trgovle promptovarami (for Kondratskiy). 6. Starshiy khudozhnik Obshchesoyuznogo doma modeley (for Yefremova). 7. Zaveduyushchiy sektorom Ukrainskogo nauchno-issledovatel'skogo instituta torgovli i obshchestvennogo pitaniya (for Berger). 8. Zaveduyushchiy sektorom Nauchno-issledovatel'skogo instituta torgovli i obshchestvennogo pitaniya, g. Moskva (for Sinyutin). 9. Zaveduyushchiy sektorom Ukrainskogo nauchno-issledovatel'skogo instituta torgovli i obshchestvennogo pitaniya, g. Kiyev (for Korzhenevskiy).  
(Russian newspapers)

GORBACH, P.

Shish kebab charcoal broiler. Obshchestv.pit. no.5:29-30 My  
'62. (MIRA 15:5)

1. Glavnyy inzh. Lyuberetskogo trgovogo mashinostroyeniya.  
(Restaurants, lunchrooms, etc.—Equipment and supplies)

GORBACH, P.

Modernising a pastry oven. Obshchestv.pit. no.1:28-29  
Ja '60. (MIRA 13:5)

1. Glavnyy konstruktor Lyuberetskogo zavoda trgovogo mashino-  
stroyeniya.

(Confectionery--Equipment and supplies)

GORBACH, P.

APB-1 refrigerated counter. Sov. torg 33 no.10:55-57 0 '59.

(MIRA 13:1)

(Refrigeration and refrigerating machinery)



GORBACH, P.

A refrigerated glass case. Sov.torg. 33 no.1:44-45  
Ja '60. (MIRA 13:4)  
(Store fixtures) (Show windows)

GORBACH, P.

Counters for school cafeterias. Obshchestv. pit. no.6:49-50  
Je '62. (MIRA 15:9)

1. Glavnyy inzhener Lyuberetskogo zavoda torgovogo  
mashinostroyeniya.  
(School children—Food)

GORBACH, P.

New cold-storage counters. Sov. torg. 35 no.3:59-61 Mr '62.  
(MIRA 15:3)  
(Cold-storage lockers)

GORBACH, P.

Automatic machinery lines for self-service restaurants.  
Obshchestv.pit. no.8:36-37 Ag '62.

(MIRA 16:10)

1. Glavnyy konstruktor Lyuberetskogo zavoda trgovogo  
mashinostroyeniya.

GORBACH, P.

Improved cafeteria food counter. Obshchestv. pit. no.6:34  
Je '63. (MIRA 16:12)

1. Glavnyy konstruktor Lyuberetskogo zavoda trgovogo  
mashinostroyeniya.

GORBACH, P.P.

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Helping the engineer in charge of the shift. Sakh.prom. 27 no.9:11-12 '53.  
(MIRA 6:11)

1. Alma-Atinskiy sakharnyy zavod.

(Industrial management)

GORBACH, P.P.

Restoration and modification of the shape and the cutting part of slicing  
knives. Sakh.prom. 27 no.10:27-28 '53. (MIRA 6:11)

1. Alma-Atinskiy sakharnyy zavod.

(Sugar machinery)

L 7837-66 EWT(m)/EPE(o)/EWP(j) RM  
ACC NR: AP5028105

SOURCE CODE: UR/0048/65/029/011/1964/1999

AUTHOR: <sup>4455</sup> Sonin, A.S.; <sup>4455</sup> Gorbach, S. S.

ORG: none

59  
53

<sup>7,4455</sup>  
TITLE: Dielectric loss in triglycine sulfate crystals [Report, Fourth All-Union Conference on Ferro-electricity held at Rostov-on-the Don 12-16 September 1964]

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 11, 1965, 1996-1999 <sup>III, 4455</sup>

TOPIC TAGS: ferroelectric crystal, single crystal, dielectric constant, dielectric loss, Curie point, electric domain structure

ABSTRACT: The dielectric constants and dielectric losses of triglycine sulfate single crystals cut perpendicular to the crystallographic axes were measured at temperatures from 20 to 70°C and frequencies from 0.5 kc to 25 Mc. The measurements below 5 kc were made with a bridge and those above 50 kc with a Q-meter. The 22 component of the dielectric constant (measured along the ferroelectric axis) and the corresponding loss tangent had pronounced maxima at (or near) the Curie point. The maximum of the loss tangent occurred at a temperature of the order of 1°C below that of the dielectric constant; this temperature shift decreased slightly with increasing frequency and increased considerably (as did the magnitude of the loss tangent) when the strength of the measuring field was increased from 15 to 45 V/cm. The loss tangent decreased with increasing frequency. For highly unipolar specimens the loss tangent

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L 7837-66

ACC NR: AP5028105

6  
was small at all frequencies above 5 kc. The dielectric constants and loss tangents measured in the 33 direction behaved quite differently, the dielectric constant showing only a small narrow peak at the Curie point and the loss tangent showing only an abrupt change of slope but no maximum at the Curie point itself. The relaxational nature of the dielectric loss in triglycine sulfate, which was established at room temperature by V.M.Petrov (Kristallografiya, 4, 632 (1961)), persists at temperatures near the Curie point, in highly unipolar specimens, however, where most of the domains do not participate in polarization reversal, the relaxation maximum is not prominent. It is concluded that investigation of dielectric losses can contribute significantly to the study of domain structure in ferroelectrics. The authors thank I.S.Zheludev and I.S.Rez for discussing the results. Orig. art. has: 8 figures.

44,55  
SUB CODE: SS,EM

SUBM DATE: 00/

ORIG. REF: 004

OTH REF: 002

Card 2/2 b/p

GOREPACH, S.T., dorozhnyy master; VASYUK, V.P., dorozhnyy master

Pay more attention to track in railroad yards. Put' i put.khoz.  
no.11:29 N '58. (MIRA 11:12)

1. Darnitskaya distantziya puti Yugo-Zapadnoy dorogi, stantsiya  
Darnitsa.  
(Railroads--Yards) (Railroads--Track)

BABICHEV, G.I., inzh.; GORBACH, T.I., inzh.; KOTLER, R.I., inzh.; KRIKUNOV,  
G.N., inzh.

New method of preventing the spontaneous combustion of coal.  
Bezop.truda v prom. 9 no.4:12-14 Ap '65.

(MIRA 18:5)

KOTLER, R.I.; KRIKUNOV, G.N.; GORBACH, T.I.

Relation of the tendency of coals toward spontaneous combustion  
to their moisture content. Nauch. trudy KNIUI no.16:69-73 '64.  
(MIRA 18:7)

S/109/62/007/006/023/024  
D234/D308

9,4160

AUTHORS: Gorbach, T. Ya. and Krolevets, K. M.

TITLE: A longitudinal photocell at high illumination intensities

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 6, 1962,  
1057-1060

TEXT: The authors consider the possibility of eliminating the dependence of readings of a photocell on the intensity of illumination, by utilizing the phenomenon of 'saturation' of transverse potential difference (discussed by the authors in previous publications) with increasing illumination in case of sharp boundaries between light and shadow. An equation is derived for the longitudinal potential difference between end points of the cell; the equation does not contain illumination intensity. Results of tests carried out on silicon and germanium specimens of longitudinal photocells are given. The authors express their gratitude to Z. S. Gribnikov for discussion and to To Yen Ch'ang for help in experiments. There

✓  
B

Card 1/2

A longitudinal photocell ...

S/109/62/007/006/023/024  
D234/D308

are 4 figures.

SUBMITTED: December 26, 1961

✓  
B

Card 2/2

S/109/62/007/006/013/024  
D271/D308

9.4160  
AUTHORS:

Gorbach, T. Ya., Gribnikov, Z. S. and Krolevets, K. M.

TITLE:

Photo-EMF of non-uniformly irradiated p-n junctions

PERIODICAL:

Radiotekhnika i elektronika, v. 7, no. 6, 1962,  
1020-1029

TEXT: The equation for a two-dimensional carrier flow in a non-uniformly irradiated junction is solved for arbitrary line irradiations, in infinite and finite specimens. Lucovsky has solved a similar equation only for the small signal case. The assumptions are: The p-region is equipotential, the potential of the n-region depends only on the distance from the light line, minority carriers travel normally to the junction and their density is small compared with that of the majority carriers. The photovoltage equation is solved for an infinite junction, for the region near the light-dark boundary and for the region about an irradiated strip. Potential distribution is also derived for a finite junction. Theoretical results were confronted with experimental mea-

Card 1/2

Photo-EMF of ...

S/109/62/007/006/013/024  
D271/D308

surements on Ge diffusion junctions doped with antimony. The production and properties of experimental samples are described, and some results are shown in graphs and discussed, stressing the significance of finite dimensions of samples. Among the conclusions are the following: The photovoltage undergoes continuous changes between the light and dark regions and, with small signals, follows exponential law, whereas with strong irradiation the potential rise in the light region is faster. The difference between the maximum and the boundary potential becomes smaller when the width of the light line is decreased. Potential at the edge of the sample is higher than it would be in an infinite junction at the same distance, and tends to a saturation limit as irradiation is increased. The influence of contacts may be considerable even when their dimensions are small. The agreement between the theory and experiments is satisfactory. There are 7 figures and 3 tables.

SUBMITTED: November 9, 1961

Card 2/2



L 13056-63 BDS/EWT(1)/EWG(k)/EWP(q)/EWT(m)/EEC(b)-2 AFETC/ASD/ESD-3  
 ACCESSION NR: AT3002992 Pz-4 JD/AT/IJP(G) S/2927/62/000/000/0122/0124

70  
69

AUTHOR: Gorbach, T. Ya.; Gribnikov, Z. S.; Krolevets, K. M.

TITLE: Photo-emf of an electron-hole junction under a nonuniform illumination  
 [Report of the All-Union Conference on Semiconductor Devices held in Tashkent from  
 2 to 7 October 1961]

SOURCE: Elektronno-dy\*rochny\*ye perekhody\* v poluprovodnikakh. Tashkent, Izd-vo  
 AN UzSSR, 1962, 122-124

TOPIC TAGS: photo-emf, n-p junction photo-emf

ABSTRACT: Distribution of photo-emf over an electron-hole junction is determined  
 by a differential equation which is examined in the article. Potential  
 distribution near the light-shade boundary is considered for low- and high-  
 intensity illuminations. The theory was experimentally verified on electron-hole  
 junctions in germanium. Rectangular 15 x 2-mm samples had 3 ohmic contacts each  
 and were illuminated either in such a way that a sharp light-shade boundary was  
 formed or with a luminous dash. Orig. art. has: 10 formulas.

ASSOCIATION: Akademiya nauk SSSR (Academy of Sciences SSSR); Akademiya nauk  
 Uzbekskoy SSR (Tashkent State University)

Card 1/2/

L 22131-65 EWT(d)/EWT(1)/EWG(k)/EEG(k)-2/T/EEG(b)-2/EWA(h) Pm-4/Pn-6/Peb/  
Po-4/Pq-4/Pg-4/Pk-4/Pl-4 IJP(c)/RAEM(a)/ESD(dp) BC

NR AP5001745

S/0302/64/000/004/0054/0066

AUTHOR: Gorbach, T. Ya.; Krolevets, K. M.; Savelov, V. N. 12

TITLE: Position-sensitive photodiodes for servo systems 15

SOURCE: Avtomatika i priborostroyeniye, no. 4, 1964, 54-56

KEYWORDS: photodiode, servo system, position sensitive photodiode

ABSTRACT: A new composite photodiode (see Enclosure 1) essentially consists of a 4-mm np-junction Ge or Si plate cross-cut by 0.1-0.3-mm-wide incisions into four equal parts. The photodiode is connected into a 2-bridge circuit with a reverse bias voltage  $E$  applied to all of its parts. When the light spot is in the center, the output signal is zero. When the spot leaves the center, output signals  $U_x$  and  $U_y$  proportional to the travel along the axes appear. Characteristics obtained with an illumination of 4,500 luxes, a spot of 1.5-mm diameter, a load resistance of 22 kohms (Ge) or 90 kohms (Si), and  $E = 5.75$  v are reported for 6

Card 1/3

L 22131-63

ACCESSION NR: AP5001745

0

specimens, values of the dark current, sensitivity, and slope of characteristic  
Zero-point drift was found to be within  $\pm 0.4$  microns in a test of a  
photodiodes for 15-20 hrs. Orig. art. has 3 figures, 1 formula, and  
1 table.

ASSOCIATION: none

SUBMITTED: 00

ENCL: 01

SUB CODE: EC

NO REF SOV: 000

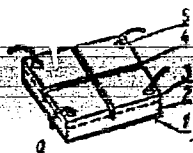
OTHER: 000

Card 2/3

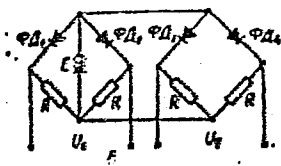
L 22131-65

ACCESSION NR: AP5001745

ENCLOSURE: 01



A 4-part position-  
sensitive photodiode  
for servo systems



Card 3 3

L 07848-67 ENT(1) GD

ACC NR: AT6034351

SOURCE CODE: UR/0000/66/000/000/0079/0091

AUTHOR: Ayvazova, L. S.; Gorbach, T. Ya.; Krolevets, K. M.;  
Savelov, V. N.

44  
43

ORG: Institute of Automation, Ministry of Instrument Making, SSSR  
(Institut avtomatiki Ministerstva priborostroyeniya SSSR)

B+1

TITLE: Four-element position-sensitive photodiodes 25

SOURCE: AN UkrSSR. Poluprovodnikovaya tekhnika i mikroelektronika  
(Semiconductor engineering and microelectronics). Kiev, Naukova dumka,  
1966, 79-91

TOPIC TAGS: photodiode, semiconductor diode, light modulation

ABSTRACT: Position-sensitive photodiodes have been produced which are based on n-p diffusion junctions in Ge doped with antimony and Si doped with boron. A 4 x 4 mm semiconductor n-p plate was divided into four equal parts by two perpendicular cuts which were deeper than the n-p junction and were 0.1 mm wide. Electrodes were deposited on the surface of each of the four photodiodes to record the output signal. In the Ge photodiodes the density of the reverse saturation current was 1—2 mamp/mm<sup>2</sup>; photosensitivity of the samples was 20—30 mamp/lm. The figures for Si photodiodes were (2—3)10<sup>-3</sup> mamp/mm (at 3 v), and

Card 1/2

L 07848-67

ACC NR: AT6034351

3—4 mamp/lm, respectively. The photodiodes were investigated in a balancing network. Basic characteristics were measured with the use of a round light spot ( $2\lambda = 1.6$  mm); the apparatus provided  $\pm 3 \mu$  readout shift accuracy. The luminous flux corresponding to the noise level of the photodiodes equalled  $5 \times 10^{-10}$  lm with a 1-cps bandwidth (at 400-cps frequency). This flux permitted the shift resolution at approximately  $0.001 \mu\text{m}$  to be determined. In measurements made with light modulation, the position of zero during 15—20 hr measurements and also at fixed elevated temperatures (up to 343K for Ge and 373K for Si) was maintained within a few tens of microns. In measurements with constant illumination and electric modulation of the output signal, the position of zero was considerably less stable. The photoresponse constant was 1.5  $\mu\text{sec}$  at loads of 3 kohm and 3  $\mu\text{sec}$  at 12 kohm. Orig. art. has: 6 figures, 1 table, and 15 formulas.

SUB CODE: 09/ SUBM DATE: Feb65/ ORIG REF: 005/ ATD PRESS: 5102

Card 2/2 JIC

AUTHORS: Gorbach, V. G. and Sadovskiy, V. D. SOV/126-6-1-13/33

TITLE: Influence of the Speed of Heating on the Manifestation of the "Heredity" of the Austenitic Structure in Preliminarily Hardened Chromium Steels (Vliyaniye skorosti nagreva na proyavleniye nasledstvennosti struktury austenita v predvaritel'no zakalennykh khromistykh stalyakh)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 1, pp 106-109 + 2 plates (USSR)

ABSTRACT: The results are described of metallographic investigation of the influence of the speed of heating and the Cr content on the extent to which the after effects of preliminary over-heating manifest themselves in the structure of steel. The aim of the work was to elucidate the changes in the conditions of re-establishment of the grain for steels alloyed with various quantities of Cr (3.47, 6.22, 12.22%). For the investigations three chromium steels were chosen, the chemical compositions of which are entered in a Table, p 107. The blanks were first hardened from 1300°C and then tempered at 650°C and sliced into cubes of 10 x 10 x 8 mm; for

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SOV/126-6-1-13/33

Influence of the Speed of Heating on the Manifestation of the  
'Heredity' of the Austenitic Structure in Preliminarily Hardened  
Chromium Steels

experiments involving rapid heating, the hardened blanks were cut into plates 1.5, 3, 6 mm thick and 10 x 10 mm cross section. Heating with a speed of 0.25 to 135°C/min was effected in an ordinary laboratory furnace, whilst heating with speeds of 135 to 1000°C/min was effected in a salt bath. After preliminary treatment the specimens were heated under the above mentioned temperature conditions until the austenitic state was reached and, following that, they were soaked for a certain time in a bath of 650°C for the purpose of partial troostite formation; this treatment was followed by hardening in water and subsequent metallographic analysis. It was found that the structure of the austenite forming during heating of preliminarily hardened steel depends to a great extent on the speed of heating. In the case of rapid heating of hardened, non-tempered steel, the initial austenite grain becomes re-established whereby the speed of heating necessary for re-establishment of

Card 2/3 the grain will be the lower the higher the chromium



SOV/126-6-1-13/33

Influence of the Speed of Heating on the Manifestation of the  
"Heredity" of the Austenitic Structure in Preliminarily Hardened  
Chromium Steels

content of the steel. In the case of slow heating of  
hardened and tempered steel a re-establishment of the  
initial grain is also observed, whereby the speed of  
heating necessary for re-establishing the grain will be  
the lower the higher the chromium content of the steel.  
There are 5 figures, 1 table and 9 references, all of  
which are Soviet.

ASSOCIATION: Institut fiziki metallov Ural'skogo filiala AN SSSR  
(Institute of Metal Physics, Ural Branch of the Ac.Sc.,  
USSR)

SUBMITTED: July 31, 1957

Card 3/3

1. Chromium steel--Heat treatment 2. Chromium steel--  
Phase studies 3. Austenite--Properties 4. Chromium--  
Metallurgical effects

SOV/126-6-4-14/34

AUTHORS: Gorbach, V.G.  
Sadovskiy, V.D.

TITLE: The Effect of Preliminary Heat Treatment on the Kinetics of Decomposition of Pearlitic Troostite in Supercooled Austenite (Vliyaniye predvaritel'noy termicheskoy obrabotki na kinetiku perlito-troostitnogo raspada pereoohlazhdennogo austenita)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 4, pp 665-672 (USSR)

ABSTRACT: It has been shown by other workers (Ref.1-6) that the structure and constitution of austenite formed at temperatures above the critical points depend on (i) the initial structure of the steel as determined by its previous thermal history and (ii) the rate at which it is heated to the austenitic temperature range. The object of the present investigation was to study (by means of magnetometric measurements and microscopic analysis) the effect of these two factors on the kinetics of transformation of supercooled austenite in three

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SOV/126-6-4-14/34

**The Effect of Preliminary Heat Treatment on the Kinetics of Decomposition of Pearlitic Troostite in Supercooled Austenite**

chromium steels (3, 6 and 12% Cr) whose complete chemical analysis is given in Table 1. In the first series of experiments, specimens of the investigated steels quenched from the austenitic range were re-heated to a temperature above  $A_3$ , and the effect of the rate of heating on the extent to which the initial structure was preserved after the secondary heating was examined. It was found that the original grains were fully preserved both after very slow and very rapid heating. The precise values of these critical rates of heating depended on the composition of steel: At "slow" rates of heating, i.e. when formation of austenite was associated with diffusion processes, the original grains of the 3, 6 and 12% Cr steels were fully preserved if the rate of secondary heating did not exceed 2, 1 and 0.25°C/min respectively. At "very fast" rates of heating, i.e. when practically no diffusion took place, full preservation of the original grains was ensured if the respective rates of heating were not lower than

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SOV/126-6-4-14/34

The Effect of Preliminary Heat Treatment on the Kinetics of Decomposition of Pearlitic Troostite in Supercooled Austenite

1000, 260 and 4°C/min. At the intermediate rates of heating (referred to later as "fast") the original grains were not preserved in the material heated to the austenitic range. In the next stage, the combined effect of (a) the preliminary treatment (determining the initial structure of steel) and (b) the rate of secondary heating (determining the degree of preservation of the initial structure after heating to the austenitic range) on the kinetics of decomposition of austenite were studied on specimens of the investigated materials subjected to one of the following thermal treatments: 1. (a) Annealing. (b) "Slow" reheating to the austenitic range (~950°C). 2. (a) Quenching of the overheated material from 1300°C and tempering at 650°C. (b) Slow reheating to the austenitic range. 3. (a) As in No.2. (b) "Fast" reheating to the austenitic range. 4. (a) No overheating. Quenching from the normal (~950°C) temperature and tempering at 650°C. (b) "Slow" reheating to the

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SOV/126-6-4-14/34

**The Effect of Preliminary Heat Treatment on the Kinetics of Decomposition of Pearlitic Troostite in Supercooled Austenite**

austenitic range. 5.(a) Quenching of the overheated material from 1300°C. (b) "Very fast" reheating to the austenitic range. 6(a) No overheating. Quenching from the normal temperature. (b) As in No.5. Some of the typical results are reproduced graphically. The "TTT" curves of the 6% Cr steel subjected to thermal treatments No.2, 3, 4 and 1 are shown in Fig.1a, b, B and 2 respectively. Fig.2a and b shows the primary pearlitic troostite formed in the 12% Cr steel subjected to thermal treatments No.2 and 3. Fig.3 shows the rate of decomposition of supercooled austenite tempered at 650°C; in the 12% Cr steel (i) overheated, quenched from 1300°C, tempered at 650°C and then reheated to the austenitic range at the "slow" (0.25°C/min), "fast" (2°C/min) and "very fast" (8, 35 and 135°C/min) rates of heating (curves a, b, B, 2 and 3) and (ii) quenched from the normal temperature, tempered at 650°C and reheated at 0.25°C/min (curve e) and 135 C/min (curve X). The "TTT" curves of the 6% Cr

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SOV/126-6-4-14/34

The Effect of Preliminary Heat Treatment on the Kinetics of Decomposition of Pearlitic Troostite in Supercooled Austenite

steel subjected to treatments No.5 and 6 are shown in Fig.4a,b. Finally, curves a and b in Fig.5 show the rate of decomposition of supercooled austenite tempered at 650°C in the 12% Cr steel quenched from 1300°C (overheated), and then reheated at "slow" and "very fast" rates of heating. The corresponding decomposition rates of austenite in specimens that had not been overheated during the preliminary treatment are represented by curves B and 2. The experimental results confirmed that certain features of the structure of a steel specimen can be preserved on heating to the austenitic range if either very slow or very fast rates of heating are employed, although it is not known why this should happen when steel is heated under such conditions that formation of austenite is associated with diffusion phenomena. It was shown also that when excessive grain growth due to overheating occurs during the preliminary treatment and when - as a result of very slow or very fast rate of heating - the large grains so

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SOV/126-6-4-14/34

The Effect of Preliminary Heat Treatment on the Kinetics of Decomposition of Pearlitic Troostite in Supercooled Austenite

formed are preserved after secondary heating, the rate of decomposition of supercooled austenite is considerably reduced. This is true for transformations occurring at temperatures near the  $A_1$  critical point: The rate of transformation in the intermediate temperature range (as can be seen from various "TTT" curves) was not affected by variation of the rate of heating during the secondary treatment, whatever the thermal history and the initial structure of the investigated specimens. Similarly, in no case was the rate of decomposition of supercooled austenite significantly affected by the rate of heating employed during the secondary treatment, if no excessive grain

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SOV/126-6-4-14/34

The Effect of Preliminary Heat Treatment on the Kinetics of  
Decomposition of Pearlitic Troostite in Supercooled Austenite

growth had occurred in the steel specimen during the  
preliminary heat treatment (curves e and \* Fig.3).  
There are 5 figures and 12 Soviet references.

ASSOCIATION: Institut Fiziki Metallov Ural'skogo Filiala AN SSSR  
(Institute of Physics of Metals, Ural Branch of the  
Ac.Sc. USSR)

SUBMITTED: 31st July 1957.

Card 7/7



69359

SOV/123-59-19-78745

Translation from: Referativnyy zhurnal. Mashinostroyeniye, 1959, Nr 19, p 127 (USSR)

18.7100

AUTHORS: Gorbach, V.G., Sadovskiy, V.D.

TITLE: The Effect of Preliminary Heat Treatment of Steel on the Kinetics of Supercooled Austenite Transformation

PERIODICAL: Tr. In-ta fiz. metallov. Ural'skiy fil. AS USSR, 1958, Nr 20, pp 311-327

ABSTRACT: The authors investigated the decomposition kinetics of supercooled austenite in steels of the grades 30Kh3, 40Kh6, 40Kh2, 37KhNZ, and 38KhON, which were preliminary hardened at a temperature of 1,300°C. The possibility was confirmed to regenerate the grains of austenite, corresponding to the initial superheating, in the course of a very slow or a very quick heating for the secondary hardening. Austenite which is formed by the non-diffusion way (quick heating), recrystallizes at lower temperatures than austenite formed by diffusion (slow heating). When regenerating the large-sized austenite grains both by the non-diffusion and by the diffusion method, a retardation of the pearlitic-troostitic decomposition of austenite can be observed, which is connected with the boundary character of the origin

Card 1/2

69359

SOV/123-59-19-78745

The Effect of Preliminary Heat Treatment of Steel on the Kinetics of Supercooled Austenite Transformation

of decomposition products. The size of the austenite grains being equal, austenite of the non-diffusion process leads to a lesser degree of the retardation of decomposition, which is explained by the fact that it retains the structural defects in the form of lattice deformations and others. 9 figures, 11 references.

S.A.G.



Card 2/2

GORBACH, V. G.: Master Tech Sci (diss) -- "The effect of previous superheating on the kinetics of the transformation of supercooled austenite and the annealability of steel". Sverdlovsk, 1959. 13 pp (Min Higher Educ USSR, Ural Polytech Inst im S. M. Kirov), 150 copies (KL, No 11, 1959, 119)

SOV/81-59-21-74224

Translation from: Referativnyy zhurnal, Khimiya, 1959, Nr 21, p 75 (USSR)

AUTHORS: Sokolov, B.K., Gorbach, V.G.

TITLE: Diffusion-Free Formation of Austenite in the Heating of Hardened Steel

PERIODICAL: Tr. In-ta fiz. metallov. AS USSR, 1959, Nr 22, pp 123 - 135

ABSTRACT: The formation of austenite in the heating of several samples of hardened alloys and steels has been investigated by roentgen-structural and microstructural methods. It has been shown that in fast heating the diffusion-free formation of austenite is possible, which is similar in character to the martensite transformation.

D.A.

Card 1/1

GORBACH, V.G., kand.tekhn.nauk; SOKOLOV, B.K., inzh.

Transformations during steel heating. Metalloved. 1 term. obr.  
met. no.6:42-44 Je '61. (MIRA 14:6)

1. Institut fiziki metallov AN SSSR.  
(Steel—Metallography)  
(Crystallisation)

S/810/62/000/000/001/013

AUTHORS: Malyshev, K. A., Borodina, N. A., Gorbach, V. G.

TITLE: Phase-hardening as a method for the toughening of austenitic steels.

SOURCE: Metallovedeniye i termicheskaya obrabotka; materialy konferentsii po metallovedeniyu i termicheskoy obrabotke, sost. v g. Odesse v. 1960 g. Moscow, Metallurgizdat, 1962, 21-28.

TEXT: The paper proposes a new method for increasing the toughness of austenitic (A) steels (S), the so-called "phase hardening" (PhH), for A which upon direct and reverse martensitic transformation (MT) undergoes appreciable toughening. The paper also adduces experimental data. PhH consists in cold treatment at liquid-N temperature and subsequent short-term heating to 600-700°C. The new method overcomes the inadequacies of plastic deformation as a sole means of toughening of austenite which is limited in the type of parts to which it is applicable and which affects the magnetic properties of the metal. The new method also has advantages over strengthening by means of dispersion hardening which is accompanied by a sharp reduction in toughness and ductility. PhH is more accurately defined as a hardening or toughening produced during phase transformation in cooling or in heating. The initial cold treatment of a suitably selected austenitic steel from

Card 1/3

Phase-hardening as a method for ...

S/810/62/000/000/001/013

room temperature to sub-freezing temperatures brings about a MT, and subsequent heating produces the reverse transformation of M into A. In high-alloyed A steels the second transformation may occur at relatively low temperatures, not exceeding 400-600°C. If the solid solution contains alloying-element atoms of low mobility, the  $\alpha \rightarrow \gamma$  transformation can proceed by a nondiffusional ordering mechanism, that is, reverse MT occurs in heating. The end result of the direct-reverse MT is a hardening (toughening) of the A. The transformation is schematically illustrated. The lab investigation comprised: (a) Fe-Ni (30% Ni), (b) A low-C alloys (0.05-0.07% C), and (c) A alloys with 0.4-0.6% C. The alloys were smelted in an HF furnace, cast into 30-kg ingots (homogenized at 1,150-1,200°C for 10-12 hrs), and were forged into rods from which specimens 3 mm diam, 50 mm long, were made for magnetometric (MM) tests, and billets 10x10x60 mm were prepared for mechanical tests. The MM specimens were heated twice in vacuum to 1,100° with an intermediate cooling to -196°C in liquid N. Uniform grain size was obtained in all alloys. Galvanometric determinations were made of the M point, the temperature of the end of the reverse  $\alpha \rightarrow \gamma$  transformation during heating, and the relative amount of M upon cooling to liquid-N temperature ( $\alpha$ , %). The PhH itself was accomplished by liquid-N cooling of the specimens to produce direct  $\gamma \rightarrow \alpha$  MT and then heating them to 20-30° above the temperature of the end of the reverse transformation  $\alpha \rightarrow \gamma$  and final cooling in water. Details of the PhH of Fe-Ni are

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Phase-hardening as a method for ...

S/810/62/000/000/001/013

described, and the role of the amount of M that participates in the PhH is interpreted. Repeated direct-and-reverse cycles (up to 8) did not afford any substantial additional toughening. The effect of alloying elements on the toughening resulting from PhH is discussed. Cr, Mn, Si, and W additions did not produce any change in toughenability from that of the Fe-Ni alloy. Up to 0.4% C improved the hardening effect from 50-65 kg/mm<sup>2</sup>. In summary, the degree of toughening of A alloys depends on the chemical composition, relative amount of M that participates in the direct and reverse MT, and the heating temperature during the reverse MT into A. Maximum toughening resulting from PhH corresponds approximately to the hardening obtained by plastic deformation "up to saturation." The process of PhH is interpreted as being due to a refinement of the block structure of the A. There are 7 figures and 5 references (3 Russian-language Soviet, 2 German).

ASSOCIATION: None given.

Card 3/3



35594  
S/126/62/013/003/006/023  
E111/E435

18.11.1

AUTHORS: Mints, R.I., Gorbach, V.G.

TITLE: Influence of phase work hardening on the durability of austenitic steels under the influence of micro impacts

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.3, 1962, 365-370

TEXT: Micro impact produces localization of the individual act of deformation in a volume commensurate with the size of the grain and its boundaries or with that of the separate structural components. In the present work the authors have studied the durability of the following steels under micro impact during cavitation.

Fe: 28.7% Ni, 0.05% C;

Fe: 20.5% Ni, 2.22% Cr, 0.6% C, 0.45% Mn, 0.50% Si;

Fe: 18.0% Ni, 2.08% Cr, 2.07% Si, 0.38% C, 0.47% Mn;

Fe: 30.0% Ni, 0.87% Be, 0.05% C.

To effect recrystallization of austenite and standardize grain size in all the alloys, the billets were heat treated and then

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E111/E435

Influence of phase work ...

subjected to one cycle of phase work hardening by cooling in liquid nitrogen after hardening and slowly heating to the temperature of the reverse martensite transformation. Specimens were machined from the billets for mechanical tests, the micro impacts were produced hydraulically in an impact-erosion test machine, the specimens were rotated at 78 m/sec and the relative durability was estimated by the weight-loss method (average for 4 specimens). The results show that phase work hardening of high-nickel austenitic alloys increases their durability under micro impact conditions by a factor of 10 to 12. Their durability nevertheless remains on the level of type 1X18H8 (1Kh18N8) steel. Phase work hardening also affects all mechanical properties; tensile strength and yield point, hardness etc increase 2 to 3-fold reaching levels equal or higher than those for type 30X10Г10 (30Kh10G10) steel. However, because the austenite solid solution is iron-nickel, the resistance to micro impacts will remain below that of the steel 30Kh10G10, in spite of the high mechanical properties. The authors conclude that the nature of the austenite solid solution has a decisive effect on

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Influence of phase work ...

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E111/E435

the resistance to micro impact. There are 5 figures and  
5 tables.

ASSOCIATIONS: Ural'skiy politekhnicheskiy institut im. S.M.Kirova  
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SUBMITTED: June 24, 1961

Card 3/3

5/126/62/014/006/002/020  
E111/E151

AUTHORS: Mints, R.I., and Gorbach, V.G.

TITLE: Influence of nickel on the resistance of austenitic steels to cavitation

PERIODICAL: Fizika metallov i metallovedeniye, v.14, no.6, 1962, 814-819

TEXT: Nickel austenite has a low resistance to micro-impact; it depends on composition and is not improved by various forms of treatment. The effect of nickel is linked with both the stability of the austenite and the nature of the plastic deformation of the sub-grains. The object of the present work was to study the influence of these factors on the stability and strengthening of austenitic steels under micro-impact. The range of compositions tested was (%): 0.28-0.87 C; 0.6-30.0 Mn; 2.25-12.6 Cr; 0.04-21.0 Ni; the martensite-point values ranged from -20 to -190 °C. The steels fall into two groups: 1) those nominally unstable, with martensite points above -70 °C; 2) those nominally stable with martensite points -90 °C and below. There is a correlation between the micro-impact resistance and the martensite-  
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Influence of nickel on the ...

S/126/62/014/006/002/020  
E111/E151

point value only for steels within the same group, but not between those in different groups, those unstable having the higher resistance. The position of the martensite point alone is an insufficient indication of the impact resistance. The important factor is the nature of the alloy solid solution. In general the stability and strengthening of manganese and chromium-manganese steels is superior to that of nickel and chromium-nickel steels, irrespective of the position of the martensite point. There are 7 figures and 1 table.

ASSOCIATION: Ural'skiy politekhnicheskiy institut im. S.M. Kirova  
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(Institute of Physics of Metals, AS USSR)

SUBMITTED: May 14, 1962

Card 2/2

ACCESSION NR: AR4041541

S/0137/64/000/004/1005/1005

SOURCE: Ref. zh. Metallurgiya, Abs. 4128

AUTHOR: Zaytsev, V. I.; Gorbach, V. G.; Yakhontov, A. G.

TITLE: Change of structure of iron-nickel alloy during reverse martensite transformation

CITED SOURCE: Izv. AN KirgSSR. Ser. yestestv. i tekhn. n., v. 5, no. 6, 1963, 139-148

TOPIC TAGS: iron nickel alloy, martensitic transformation, heat treatment, x ray investigation

TRANSLATION: There was investigated an Fe-Ni alloy of composition (%): C 0.04, Si 0.38, Mn 0.33, Ni 28.33. Alloy underwent the following heat treatment: after hardening, test pieces were cooled to -200° in liquid N2 to obtain martensite, then heated to a temperature of 980° for carrying out reverse martensite transformation. In the investigated alloy direct martensite trans-

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ACCESSION NR: AR4041541

formation develops lower than  $-20^{\circ}$ , and inverse--in the region of temperatures 400-500°. X-ray investigations established that the fine structure of an alloy experiencing direct and reverse martensite transformation is characterized by a small magnitude of blocks in crystallites and presence of significant dis-orientation of blocks and fragments with respect to grain. Block structure of martensite is transmitted, during reverse transformation, to austenite. During reverse transformation there is observed also inheritance of the angle of mosaic structure; alpha-delta-transformation is accompanied by development of fragmentation. Such state of structure is sufficiently heat resistant and is preserved to a temperature of  $\sim 700^{\circ}$ . It is shown that during the hardening phase, in the hardening, there occurs not only direct but reverse martensite transformation. Bibliography: 16 references.

SUB CODE: MM

ENCL: 00

Card 2/2

GORBACH, V.G.; BUTAKOVA, E.D.

Metallography of martensite transformation into austenite. Fiz.  
met. i metalloved. 16 no.2:292-297 Ag '63. (MIRA 16:8)

1. Institut fiziki metallov AN SSSR.  
(Iron-nickel alloys—Metallography)  
(Phase rule and equilibrium)



IZMAYLOV, Ye.A.; GORBACH, V.G.; YAKHOTOV, A.G.

X-ray microbeam investigation of the structure of martensite and austenite during the direct and inverse martensite transformation in Fe-Ni alloys. Fiz. met. i metalloved. 16 no.3:349-354 S '63.  
(MIRA 16:11)

1. Kirgizskiy gosudarstvennyy universitet i Institut fiziki metallov AN SSSR.

L 79999-65 EWT(d)/EWT(m)/EWP(w)/EWA(d)/EWP(v)/T/EWP(t)/EWP(k)/EWP(h)/EWP(e)/  
EWP(l)/EWA(c) Pf-L/Pad IJP(c) JD/EW/GS

ACCESSION NR: AT4049810

S/0000/64/000/000/0027/0032

AUTHOR: Gorbach, V. G.; Maly shev, K. A.; Vladimirov, L. R.; Smirnov, L. V.

TITLE: Hardening of cast austenitic steel by the phase working method

SOURCE: Soveshchaniye po uprochneniyu detaley mashin, 1962. Protsessy uprochneniya detaley mashin (Processes of the hardening of machine parts); doklady soveshchaniya, Moscow, Izd-vo Nauka, 1964, 27-32

TOPIC TAGS: cast steel, austenitic steel, cast austenitic steel, phase working, steel hardening, steel grain structure, steel mechanical property

ABSTRACT: The term phase working means to alter the mechanical properties of a metal alloy by direct or reverse phase transformation. This phenomenon appears to the greatest extent when the volume changes during crystal lattice transformation. The aim of the present investigation was to determine the possibility of hardening cast austenitic alloys by phase working and to determine the hardening characteristics peculiar to cast steel. Two alloys were tested. 1) C-0.39%, Mn-0.61%, Cr-2.04%, Ni-17.75%, and 2) C-0.05%, Si-0.5%, Mn-0.4%, Cr-0.1%, and Ti-1.5%. This chemical composition permitted determination of the effect of the cast structure on alloy hardening by phase working. The direct and

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The martensitic transformation temperature interval was determined with a D. S. and V. I. Truzin magnetometer. Both alloys were cast into 12-kg ingots and were then forged into 12x12 mm bars which were ground from them in water. The samples were 6 mm in diameter with a working part of 60 mm. The alloy 10 could not be tested since it is always magnetic. The samples were heated to 1460 and were then placed in a furnace heated to 20-40° above (transformation temperature) for 1-2 minutes, after which they were water quenched. The tests showed that multiple phase working does not improve the mechanical properties in comparison with single phase working. Phase working of cast steel leads to results similar to those obtained with forged alloys. The mechanical properties of a forged alloy are higher than for a cast alloy, while a cast alloy shows a continuous drop in resiliency as the number of phase working cycles increases. Further tests of the alloys showed that higher strength is obtained after phase working when the initial yield point is higher. The authors conclude that a coarse grain structure in cast alloys and dendritic liquation do not affect the development of direct and reverse martensitic transformation, but do not prevent hardening of cast steel by phase working. As a result of phase

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ACCESSION NR: AT4049810

the strength of cast steel increases 1.5-2 times more than that of forged steel. Although the absolute value remains lower by 10-20%. Cast steel after forging has a coarse grain structure and significant heterogeneity. Orig. 3 figures.

ASSOCIATION: None

SUBMITTED: 21May64

ENCL: 00

SUB CODE: M21

NO REF SOV: 002

OTHER: 000

Card 3/3 *pm*

СВЕТЛОТРАВАТОРСКА АКАДЕМИЯ - СВЕТОТРАВАТОРСКА АКАДЕМИЯ

СВЕТОТРАВАТОРСКА АКАДЕМИЯ

Светлов, Ye. A.; Gorbach, V. G.; Yashchuk, M. G.

8

On the cold working of high carbon austenitic steels

Сб. работ кафедры физ. металлов. Изд. по физ. тверд. тел. 1964, 141-156

metallurgy, metal testing, ferro-metal, metal testing, austenitic

ABSTRACT: The effect of carbon content on the mechanism of hardening ferro-

metals is investigated. It is shown that the hardening of ferro-

metals is determined by the carbon content and the grain size of the

metal. The hardening of ferro-metals is determined by the carbon

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L 12415-65 EMT(m)/EMP(w)/EMA(d)/EMP(t)/EMP(b) Pad ASD(m)-3 JD/EM/MLK

ACCESSION NR: AT4046868

S/0000/64/000/000/0352/0357

AUTHOR: Zaytsev, V.I., Gorbach, V.G. 6

TITLE: Comparison of the fine structure of austenite formed from common and deformed martensite

SOURCE: AN SSSR. Nauchnyy sovet po probleme zharoprochnykh spлавov. Issledovaniya staley i spлавov (Studies on steels and alloys). Moscow, Izd-vo Nauka, 1964, 352-357

TOPIC TAGS: austenitic steel, austenitic steel structure, austenitic steel crystal, cold worked austenitic steel, austenite, martensite, martensitic steel, martensitic steel structure, steel fine structure

ABSTRACT: It is well known that the ~~ferrous~~ martensitic transformations produce a distorted crystal lattice. The present paper compares the fine structure of cooled martensite and the cold worked austenite obtained from cooled martensite with the fine structure of deformed martensite and cold worked austenite obtained from deformed martensite. A Fe-Ni ingot was heated at 1150C for 12 hours. After quenching from 1100C, the first set of samples was cooled in liquid nitrogen to obtain martensite, while the second set was rolled. During the first passage the samples were rolled at

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ACCESSION NR: AT4046868

0

-20°C and during each following passage the temperature was increased so that at the end the temperature was somewhat higher than the temperature of the martensitic transformation. All samples were tempered at 20-900°C. The samples were X-rayed before tempering and after cooling to room temperature by the VRS-50 apparatus (Fig. 1a) and in a VRS camera with a Siemens camera (Fig. 1b) and a microphotography system (Fig. 1c). The results did not show any significant differences in the expansion of austenite. Expansion was similar for both types of martensite (Fig. 1a and the Enclosure). The distortion of the crystal lattice of cold worked austenite obtained from cold worked martensite was higher than in that obtained from deformed martensite. The curves for cold worked types of austenite show the growth of block volume as the temperature rises while line expansion and microflaws are lowered (Fig. 2). At room temperature cold worked austenite from deformed martensite is deformed less than the austenite in cooled martensite samples (Fig. 3). On the basis of analyses of the curves in Figs. 1a and 2a it may be assumed that the lower the structural flaws the higher the stability during heating. It may also be assumed that the degree of lattice distortion and of their interaction are very important. It is clear that the cold-worked austenite inherits the structure of the martensite parent metal it is formed.



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The degree of hardening of the residual austenite and the flaws of the crystal lattice, connected with the size of the martensite crystals. When the size of the martensite formations are larger, there are more flaws in the residual austenite. On the basis of analyses of the curves in Fig. 2 it may be assumed that cold worked austenite obtained from deformed martensite is of lower quality at a lower temperature than cold worked austenite obtained from cooled martensite. The authors express their thanks to Prof. V. D. Salovskiy and K. A. Mikhaylov for their assistance in the work and also for taking part in the discussion of the results of the work.

ASSOCIATION: none

SUBMITTED: 16Jun64

ENCL: 03

SUB CODE: MM

NO REF SOV: 009

OTHER: 002

Card 3/6

ACCESSION NR: AT4046872  
 EWP(6)/EWP(6)/EWP(b) P.4  
 ASD/1.3  
 S/0000/04/000/000/0000

AUTHOR: Gorbach, V. G., Izmaylov, Ye. A.  
 TITLE: Structure of steel hardened by phase cold working

SOURCE: AN SSSR. Nauchnyy sovet po probleme zharoprochnykh splavov. Issledovaniya  
 strukturnykh i splavov (Studies on steels and alloys). Moscow, Izd-vo Nauka, 1964, 360-383

TOPIC TAGS: steel structure, steel grain, martensite, austenite, cold working,  
 nickel steel, yield point, metal roentgenography

ABSTRACT: Phase cold working consists of direct and reverse martensitic transformation  
 and increases the strength 2-3 times in comparison with initial conditions. The present  
 authors investigated the fine structure of austenite and the laws of its formation during  
 phase cold working under different conditions. A Fe-Ni alloy containing 0.04% C, 0.43% Si,  
 0.3% Mn, 0.17% Cr, and 0.47% Ni was used. This alloy had already been investigated pre-  
 viously and hardening had been found to triple the yield point. The alloy was annealed for  
 2 hours at 1100C and was then cooled to different temperatures below the martensite point.  
 Thus, samples with 18, 26, 30, 47, 55, 72 and 84% martensite were obtained. Each set  
 was heated to 430-1100C every 100C prior to X-ray analysis. At temperatures above 450C



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ACCESSION NR: AT4046872

ASSOCIATION: None

SUBMITTED: 16Jun64

NO REF SOV: 008

ENCL: 02

OTHER: 001

SUB CODE: MM

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